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ABSTRACT

An input-output model for studying student outcomes is examined, along with the results of a longitudinal study using this approach. An Entering Student Survey was designed to measure characteristics of incoming students, including demographics, expectations, and aspirations. A Follow-up Survey measured outcomes that were relevant to the college's goals and objectives. Factor analysis resulted in 27 entering student variables, 41 college program and activity variables, and 17 outcome variables. The Follow-up Survey included variables for faculty-student interaction, student-student interaction, the amount of students' extracurricular activities, participation in the Freshman Seminar, student major, and living on campus. The outcomes concerned student satisfaction, perceptions of the college's contribution to intellectual development, personal goal development, self-image, and self-confidence. The study population was all fall 1979 entering students and all 1982 seniors (84 percent of the original sample). Stepwise multiple regressions and analysis of covariance of the outcomes and significant input and intervening variables were performed. In addition to examining the findings for specific variables, methodological concerns for addressing student outcomes are identified, along with three relevant research questions. (SW)

ASSESSING GOAL RELATED STUDENT OUTCOMES

for

ACADEMIC DECISION-MAKING

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Elizabeth F. Fox, Chair
Forum Publications Editorial
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INTRODUCTION:

The question of college impact on students has been addressed extensively in the literature [Astin, 1974; Feldman and Newcomb, 1969; Hyman, Wright, & Reed, 1975; Winter, McCllelland, and Stewart, 1981]. These authors demonstrated the complexity of the question which is confounded with issues of self-selection, differential incoming characteristics, and its longitudinal nature. A further complication is differentiating changes due to attendance at college from those due to natural maturation.

Many approaches have been undertaken to determine the effect of the college experience on students. Fundamentally, the issue of concern has to do with the changes students undergo as a result of their experiences in college. This is important to post-secondary education because of an administrative emphasis on academic goal achievement [Balderston, p. 8]. Most institutions of higher education do have a mission or goals statement, however vague or ambiguous it may be [Cohen and March, p. 4]. Usually these statements include references to student outcomes. Different institutions have different ideas about what student outcomes are, and even have different priorities for them, but most still acknowledge some degree of concern for such goals [Gross and Grambsch, p. 197]. The purpose of the planning and resource allocation process in post-secondary education is to achieve institutional objectives. The use of student outcomes is appropriate in determining the level of achievement of academic goals related to student development.

In this paper, we first review three major approaches to the question of college impact. We then specify the focus of this paper, and develop the

research questions of interest. A presentation of the approach and methodology used in this study follows. After a presentation of the results, we conclude with a discussion of our findings and some generalizations about the application of outcome research at the institutional level.

BACKGROUND:

For the purposes of this study, student outcomes are defined as changes in students as a result of their experiences during college. These changes can be the result of many aspects of the college environment, including academic, physical, or extracurricular features. It is appropriate for an administrator to determine the effect of these environmental features on outcomes defined as important by the college's mission statement.

Unfortunately, much of the research on student outcomes reported to date does not allow us to answer such questions within the environment of a single institution. Instead, most student outcome research is concerned with two other questions.

The first question focuses on students who attend college contrasted with those who do not. It is generally acknowledged that such research is confounded by problems associated with differential characteristics between attendees and non-attendees, and questions about self-selection and normal maturation. However, it is widely accepted that the college experience has effects beyond those associated with maturation [Feldman and Newcomb, 1969; Hyman, Wright, and Reed, 1975].

For instance, in their classic study, Feldman and Newcomb [1969] reported seven broad conclusions regarding the impact of college education on students: an increase in open-mindedness, sensitivity to aesthetic and "inner" experiences, intellectual interests and capacities, independence and dominance, and impulse expression; and a decrease in conservatism and religious interest. Astin

[1977] indicates that college graduates tend to be more liberal and secular, have a greater sense of competence and self-worth, and have a more positive reflection of their own self-concept. Hyman, Wright, and Reed [1975] found that college increases students' levels of certain types of knowledge, as well as increases the amount of new knowledge gained through print media and continuing education. Finally, a recent study by Winter, McClelland, and Stewart [1981], showed the effects of college attendance on outcomes associated with liberal education.

The second research question related to college outcomes deals with the differential effects among colleges. Most colleges have relatively unique mission statements. Those which emphasize liberal arts education should demonstrate different outcomes from those having a technical or vocational mission.

The literature supports a positive conclusion about this question. Astin [1977, Chapter 8] demonstrated such results. He showed that colleges which differ on several characteristics (such as size, religious affiliation, two-or four-year, same sex vs. coeducational, predominately black or white, and residential vs. commuter orientation) all result in differential levels of various outcomes. Winter, McClelland, and Stewart [1981, Chapter 6] also directly addressed this question in a study of seven specific colleges. They found that colleges which emphasize liberal arts education, in contrast to those which do not, enhance students abilities to adapt to changes in their environment, improve critical thinking and conceptual skills, develop independence of thought, and increase students' sense of being special. This study is thorough in its approach to the questions of college impact, though limited to outcomes related to liberal education.

The above research demonstrates that the question about the impact of college attendance can be answered. It also shows that colleges have differential effects on students. But the more important concern of administrators is, which specific activities lead to enhanced student outcomes relative to a particular college's mission statement? Only the study of Winter, McClelland, and Stewart [1981, Chapter 5] reports research addressing this question. Their study reported several factors related to differential outcomes within a single institution. They found that amount of academic involvement, participation in extra-curricular activities, residential arrangements, cultural participation, sports involvement, amount of voluntary service, and majoring in the natural sciences, had an effect on the liberal arts outcomes within the environment of a single college.

Other studies have also addressed the aspects of a single college environment which have an effect on outcomes. Endo and Harpel [1982] demonstrated the effect of differential levels of student-faculty interaction on a variety of student outcomes. Theophilides, Terenzini, and Lorang [1984] also reported that college experiences do have an effect on perceived growth reported by students. Such experiences as involvement in social life, and quality of student-faculty interaction were reported to be related to the outcome changes. These studies are of interest to the researcher/administrator of a college who wishes to make decisions regarding the allocation of resources to competing programs within their own institution. However, they are of little help unless the outcomes addressed in the literature are relevant to that college's mission statement.

Elfner [1977] developed a model using student outcomes which were related to a college's goals and objectives. He specified that the outcomes used should be those which are relevant to the mission statement of the college.

The relationship between desired outcomes and programs and experiences undertaken by students could then be established through input-output oriented outcomes research, and the results applied to the decision-making process. The purpose of this paper is to report the results of a longitudinal study undertaken to establish the viability of such an approach.

Specifically, the research question of interest is: Can differential results on goals related outcomes be measured and attributed to specific programs and activities students experience, while at the same time accounting for the methodological questions concerning the differential incoming characteristics of new students and self-selection biases? These concerns represent a more sophisticated view of student outcome research, in that goal specific information that is directly relevant to the decision-making process in higher education is provided for the administrator.

In addressing this question we next present the methodological issues relevant to this study. Our techniques used to account for these questions are explained, followed by the results of our questionnaire development and analyses. After the methodological issues are presented, we describe the results of our longitudinal study of incoming students who were graduating as seniors four years later. Finally, we discuss these results, the limitations of our study, and suggest some issues and methodological approaches which may be of interest for further research.

METHODOLOGICAL CONCEPTS:[1]

The standard model for addressing student outcomes presumes the use of survey research. Most research on student outcomes uses surveys. In order

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[1] The following section draws heavily from Elfner, 1977, pp. 107-118.

to best implement survey research, two main approaches are available: cross-sectional and longitudinal. Data collected in either of these ways can be used appropriately by the decision maker if their limitations are recognized and understood.

Cross-sectional data are those gathered at one point in time. The data may be from different classes or age groupings of students, but all submit their responses at the same time. This approach suffers from two very limiting faults [Feldman and Newcomb, 1969, p. 52]. First, freshman-senior differences may be attributable to different incoming characteristics of the students, rather than the activities and programs they experience, since cross-sectional data obscures the differences in incoming characteristics that might exist among the various class groups.

The other fault of cross-sectional data is that even if current seniors were, as freshmen, similar to current freshmen, there may have been a selectivity factor at work separating those who are in the senior class from those who failed to persist through all four years. Thus, the remaining seniors may be a specific subset of those who entered the college four years previously, and the characteristics of that subset may or may not be similar to the current freshmen [Feldman and Newcomb, 1969, p. 52-53]. We strongly recommend that those who wish to employ cross-sectional data have a method of comparing the incoming characteristics of students across classes in order to be able to judge the degree of similarity among them.

Longitudinal strategies overcome the first shortcoming of cross-sectional analyses [Feldman and Newcomb, 1969, p. 52]. This approach, however, does not directly address the fact that students who failed to persist through four years may have biased the resulting group of seniors. Typically, longitudinal approaches employ pre- and post-measures of desired outcomes, using difference

(or change) scores for analysis. Marcus, [Marcus, et al., 1972, p. 114] suggest that change scores suffer from serious methodological problems because they are artificially dependent on initial scores. Ceiling and floor effects, and regression effects, are the most serious statistical problems. Such effects are the result of statistical artifacts in the analysis of pre- and post-scores.

Astin [1977, Chapter 2] presents a methodology which seems to successfully address this concern. He uses an "input-output" model in which pre-scores are used to predict post-scores, and the differences between the actual and predicted post-scores, called residuals, are u.ed to analyze the effects of different college experiences. While his application of this model is across colleges, this approach can be adapted directly to intra-institutional studies, with the various college programs and activities becoming the environmental factors being assessed.

The input-output model is not without faults. First, in determining a predicted outcome score for a subject, logic suggests that all possible relevant predicting variables must be defined and measured. This is normally not feasible in most research designs. An attempt can usually be made to include the most logical predictors, and empirical analyses can be undertaken to assess the effects of other possible predictors.

A more serious problem is that residual score analyses do not easily lend themselves to the demonstration of joint effects. To the extent that student incoming characteristics and college programs and activities have totally independent impact on student outcomes, this problem is negligible. However, because of the evidence reviewed previously, it can be concluded there is likely to be a relationship among incoming student characteristics and environmental effects. The result of this methodological shortcoming is that

the effect of the predictor variables tends to be overstated, and the effect of the college programs and activities tends to be understated. Several techniques can be employed to overcome this shortcoming, but suffice it to say that analyses which do show statistically significant effects of college programs and activities are likely to be conservative in their findings, and can be confidently employed in administrative decision-making. [Elfner, 1979].

METHODS:

In this section we describe the adaptation of the above methodological issues used in this study. We developed an Entering Student Survey to measure those characteristics of incoming students which seemed to be relevant to the desired outcomes. It consisted of 14 questions, most of which contained multiple items. These questions were designed to assess demographics, expectations, aspirations, and the current status of each relevant outcome variable. We also developed a Follow-up Survey which was designed to measure outcomes which were relevant to the college's goals and objectives. It consisted of 23 questions, again most of which contained multiple items. In addition to measuring the goal related student outcomes, our Follow-up Survey contained questions assessing the perceived amount and quality of experience students had with various college programs and activities during their four-year college experience.

Each survey was factor analyzed, using a standard varimax rotation strategy. Items which loaded at a level of 0.4 or greater on a factor were aggregated into a score for that factor. This analysis resulted in 27 entering student charac-teristic variables, 41 college program and activity variables, and 17 outcome variables. Variables representing Entering Student characteristics included demographic items such as age at enrollment, sex, high school

rank-in-class, and high school GPA. In addition, we assessed expectations related to satisfaction with several activities at the college, and included items designed to assess academic aspirations (highest degree planned), and two personality dimensions related to th- -'-ege's goals. For a more detailed description of the entering student variables, see TABLE ONE.

TABLE ONE

Input Variables

INPUT VARIABLE	DESCRIPTION	EXAMPLE ITEMS
ENTAGE	Age at enrollment	
HSRIC	High school rank in class	
HSGPA	High school grade point average	
HSXCDR	Participation in high school drama, music, or journalism	
HSXCSOC	Participate in high school social or service groups	
HSXCATH	Participate in high school athletics (intramural or inter-scholastic)	
HSXCORG	Participate in high school academic groups or part-time work	
YRSMT	Number of years of HS math	
YRSSC	Number of years of HS science	
YRSFL	Number of years of HS language	
YRSSS	Number of years of HS social science	
EXPSAT	Expected level of satisfaction	
XACT	Aggregate expected amount of college activities	- freedom in course selection - social life - personal contacts with classmates - work required in courses - outlets for creativity - personal contacts with faculty - personal contacts with family - advice and guidance from faculty
XRECSAT	Expected satisfaction with amount of leisure	- expected amount of sleep and exercise
FRPRFDE	Entering student PRF Defendence score	
FRPRFDY	Entering student PRF Desirability score	

We assessed the students' involvement in various college programs and activities through the Follow-up Survey, and through several items from standard college records. Included in this category of variables were four faculty-student interaction variables, two student-student interaction variables, 20 variables related to the amount of the respondents participation in extracurricular activities, and three others - participation in the college's Freshman Seminar, Major, and the number of semesters the respondent lived in on-campus housing. TABLE TWO presents the significant intervening variables.

TABLE TWO

Intervening Variables

INTERVENING VARIABLE	DESCRIPTION	EXAMPLE ITEMS
FSGNRL	General faculty/student interaction	- number of personal friendships with faculty - closeness of personal friendships with faculty - discussed academic matters of general education and major programs with faculty - discussed academic matters concerning specific course with faculty - discussed intellectual matters with faculty discussed career and vocational interests with faculty discussed options for grad school with faculty was helped with specific assignments by faculty discussed general topics of mutual interest with faculty
FSNMAJ	Amount and Quality of Faculty/ Student Interaction w/n major	- amount of academic advising - amount of advising - amount of helpfulness of faculty in major
FSOMAJ	Amount & Quality of Faculty/Student Interaction outside major	- amount of help received from faculty in other majors - quality of help received from faculty in other majors

SSPSNL	Discussion of personal problems & transferring with other students	- discussed transferring from SNC with students - discussed leaving college altogether with other students
SSGNRL	General interaction with other students	- discussed academic requirements with students - discussed intellectual topics with students - discussed career concerns with students - gave extra help to students with coursework - discussed personal problems with students - discussed general topics with studen
RESHSG	Number of semesters of residence in on-campus housing	
XACTOFF	Number of extracurricular activities as an officer	
SRXCUR5	Participated in choral, career, or non-resident activities as Senior	- choir/swinging knights - C.S.A. - career service programs
SRXCUR7	Participated in Greek or student government activities as Senior	- fraternity/sorority - student government - student/faculty committees - planning for homecoming/ winter carnival
PRXCUR3	Participated in academic or service service groups as underclassman	- academic clubs - outreach - C.S.A. (-) - quality of academic advising - quality of vocational advising - quality of help received from faculty in major
FSPSNL	Discussed personal problems and transferring/dropping out of college with faculty	- discussed personal problems with faculty - discussed transferring from SNC with faculty - discussed leaving college altogether
CWKEXP3	Participated in part-time work off campus (SR)	
CURWKHRS	Average work hours/wk as senior	

The 17 outcomes defined by the factor analysis in luded five related to satisfaction, three related to the respondents' perception of the college's contribution to intellectual development, seven which measured various aspects of personal goal development, and two personality dimensions related to self-image and self-confidence. See TABLE THREE.

TABLE THREE

Outcome Variables

OUTCOME VARIABLE	DESCRIPTION	EXAMPLE ITEMS
SRSAT	Global Satisfaction	- How satisfied are you with SNC? 0 = very dissatisfied, 4 = very satisfied
SRACT	Aggregate Satisfaction	- Freedom in course selection - Personal contacts with classmates - Work required of student in courses - Outlets for creative activities
SRFACSAT	Satisfaction with the amount of contact with, and guidance from faculty	
SRRECSAT	Satisfaction with the amount of recreation and contact w/family	
SRSOCSAT	Satisfaction with the amount of social life	
GNRLID	General Intellectual Development	- development of knowledge of basic facts - development of ability to learn independently about a discipline - stimulating intellectual thinking - development of ability to question reliability of information - development of ability to integrate a variety of information - development of analytical skills - development of ability to apply general concepts to new situations

QUANTID	Quantitative and Computer Skills	- development of writing skills - development of verbal communication skills
COMMID	Oral and Written Communication	- development of writing skills - development of verbal communication skills
PGCAKNOW	Has Knowledge about Career Opportunities	- used leisure-time activities and courses for career interests - has confidence in ability to make career decisions - can name entry level position for which s/he is eligible - has decided on field in which s/he would like to study - knows basic qualifications for occupations in which s/he is interested
PGCACONF	Has confidence about future career opportunities	- has confidence in ability to make decisions regarding a career - has studied material about what to expect in a job interview - can create one's own future by realistically assessing opportunity
PGPSNL	Has knowledge about marriage, children, and personal goals	- knows whether or not to have children - has considered relationships among marriage, children and a career - has established priorities for personally important goals
PGCASSOC	Has joined or attended meetings of career oriented organizations	- has attended meetings of a club which is related to chosen career - is a member of at least one club related to one's career
PGCAPLNG	Has done career planning activities	- has studied material on what to expect in a job interview - feels as though s/he does not just drift along - has used the services of the career planning office - often talks with academic advisor about matters affecting future

PGCAANX	Is satisfied with career plans	- has a clear plan of what to do with life - has a clear plan for obtaining a job after graduation - knows field in which s/he will study
PGCADISC	Has discussed career opportunities with others	- has asked others to explain kinds of positions available - has discussed intended career with someone already in field
SRPRFDE	Senior PRF Defendence Score	
SRPRFDY	Senior PRF Desirability Score	

In the fall of 1979, all entering students completed the Entering Student Survey. In December 1982, we administered the Follow-up Surveys to all seniors. We were able to match 176 of the senior responses with their Entering Surveys collected four years previously. These 176 matched responses represent nearly 84% of the approximately 210 1979 freshmen who were still on campus in December of 1982. Since our research is concerned with the effect of a four-year experience at this college, this number represents a comprehensive sample of the relevant population.

Our results are presented in the next section of this paper. In the concluding section we present and discuss implications of these results for the college's decision-makers.

RESULTS!

The analysis of the data obtained involved a two-stage process. First, stepwise multiple regressions of the outcomes on all relevant input variables were performed in an attempt to determine whether any of the input variables needed to be partialled out in subsequent analyses. The second stage of the analysis involved performing either analysis of covariance (in the case of the categorical variable MAJOR) or stepwise multiple regression (all other variables), controlling for all relevant input variables, of outcomes on all intervening variables. Because of the many analyses generated, the only relationships reported in this study are those which demonstrated a statistical significance at the 0.01 level or less. The results of these analyses are summarized below and in TABLE FOUR.

TABLE FOUR

Standardized Regression Coefficients for Outcomes and Significant Input and Intervening Variables

Outcome	Input Variable	Beta*	Intervening Variable	Beta*	R	R^2 Change
GNRLID	YRSSS	.217	FSOMAJ	.385	.426	.148
QUANTID	YRSMT	.235				
	ENTAGE	-.160				
	HSRIC	-.165				
COMMID			FSNMAJ	.411	.386	.149
			SRXCUR7	.387	.500	.101
			PAWKEXP1	-.252	.547	.050
			SRXCUR5	-.244	.597	.057

Outcome	Input Variable	Beta*	Intervening Variable	Beta*	R	R^2 Change
PGCADISC	HSXCSOC	.204	SSPSNL	.303	.375	.063
			FSNMAJ	.293	.462	.073
PGCAANX	HSXCSOC	.296	FSNMAJ	.289	.464	.082
	HSXCDR	-.246				
PGCAPLNG	ENTAGE	-.301	FSNMAJ	.359	.380	.098
	HSXCSOC	.253	SSGNRL	.232	.463	.070
			CURWKHRS	.316	.515	.050
			RESHSG	.281	.573	.063
PGCASSOC			PRXCUR3	.325	.369	.136
			FSPSNL	.254	.445	.062
PGCACONF	HSXCATH	.203	FSNMAJ	.297	.357	.088
PGPSNL	HSXCORG	.258				
	HSGPA	.214				
PGCAKNOW			SSGNRL	.328	.328	.107
SRSAT	EXPSAT	.188	FSNMAJ	.420	.483	.167
	HSXCATH	-.160				
SRACT	XACT	.296	FSNMAJ	.305	487	.089
	FRPRFDE	-.185	SRXCUR5	-.284	.564	.081
SRFACSAT	EXPSAT	.222	FSGNRL	.474	.519	.239
	HSXCATH	-.177	XACTOFF	-.229	.565	.050
SRRECSAT	XACT	.268	SRXCUR5	.258	.392	.066
	HSXCATH	.212				
SRSOCSAT	XRECSAT	.316	CWKEXP3	.238	.592	.056
	FRPRFDY	-.202				
	HSGPA	.183				

*The reported regression coefficients are those obtained at the final step of the analysis.

Intellectual Development Outcomes

General Intellectual Development (GNRLID). The regression of outcomes on input variables yielded a single significant relationship ($t(141) = 2.640$, $p < .01$). The more social science courses a student took while in high school (YRSSS), the higher his or her perceived general intellectual development tended to be. Controlling for this effect, the intervening variable concerning the interactions that students had with faculty outside the student's major (FSOMAJ; $F(1,100) = 18.134$, $p < .001$) was found to be significantly related to GNRLID. Faculty-student interactions of this type appear to promote the perceived general intellectual development of the student.

Quantitative and Computer Skills Development (QUANTID). Three significant relationships were found when QUANTID was regressed on the input variables. The number of mathematics courses taken in high school (YRSMT; $t(166) = 3.138$, $p < .001$) was positively related to perceived quantitative development. The age at which the student entered college (ENTAGE; $t(166) = -2.200$, $p < .02$) was negatively related to QUANTID, indicating that younger students at entry possess a higher level of perceived quantitative and computer skills when seniors. Finally, high school rank in class (HSRIC; $t(166) = -2.191$, $p < .05$) was also found to be negatively related to QUANTID, indicating that the brighter high school students tended to perceive themse' es as having stronger quantitative skills.

Only one intervening variable was found to be related to perceived quantitative development after controlling for the above mentioned input variables. The student's major was seen as contributing to perceived intellectual development ($F(7,151) = 6.439$, $p < .001$) with students majoring in the natural sciences, accounting, and general business perceiving themselves as having more quantitative skills than students majoring in the humanities, education, and communications.

Communication Skills (COMMID). No significant relationships were found between the perceived level of communication skills and any of the relevant input variables. However, four intervening variables were associated with the perceived development of communication skills. Faculty-student interaction within the student's major (FSNMAJ; $F(1,101) = 17.632$, $p < .001$) was positively related to COMMID, indicating that those student's who interacted frequently with their major professors viewed themselves as more skilled in communications. Students appear to believe that participating in fraternities and sororities, student government, student-faculty committees, and planning for homecoming and winter carnival during their senior year (SRXCUR7; $F(1,100) = 13.465$, $p < .001$) fosters the development of communication skills. Conversely, students tend to view participation in choir and career service programs during their senior year (SRXCUR5; $F(1,98) = 8.763$, $p < .01$) and serving as a residence hall assistant or director prior to their senior year (PAWKEXP1; $F(1,99) = 7.060$, $p < .01$) as having a detrimental effect on the development of communication skills.

Personal Goals Outcomes

Discussion of Career Opportunities (PGCADISC). The regression of this outcome on the relevant input variables yielded one significant relationship. Those students who participated in high school social or service groups (HSXCSOC; $t(167) = 2.696$, $p < .01$) were more likely to have discussed career opportunities with others while in college. Controlling for this effect, two significant relationships were found between this outcome and the intervening variables. Those students who were more likely to discuss personal problems with other students (SSPSNL; $F(1,102) = 7.451$, $p < .01$) were more likely to have discussed career opportunities. Likewise, those students who interacted more frequently with faculty within their major ($F(1,101) = 9.409$, $p < .01$) were also more likely to have discussed career opportunities.

Satisfaction with Career Plans (PGCAANX). Two significant relationships were found when this outcome was regressed on the relevant input variables. Participation in high school social or service groups ($t(147) = 3.641$, $p < .001$) tended to increase a student's satisfaction with his or her career plans. Conversely, participation in drama, music, or journalism, (HSXCDR; $t(147) = -3.030$, $p < .01$) tended to result in a decrease in satisfaction with career plans. Students experiencing higher levels of interaction with faculty within their major (FSNMAJ; $F(1,102) = 9.364$, $p < .001$) tended to report higher levels of satisfaction with their career plans than other students.

Career Planning Activities (PGCAPLNG). The regression of this outcome on the relevant input variables yielded two significant relationships. One's age upon entering college was negatively related to this outcome (ENTAGE; $t(145) = -3.962$, $p < .001$), indicating that younger students at entry had done more career planning than older students. Those students who had participated in social or service groups during high school were also more likely to have engaged in career planning activities ($t(145) = 3.317$, $p < .01$). Four intervening variables obtained significant positive relationships as well. Students who more often interacted with faculty within their major (FSNMAJ; $F(1,102) = 11.697$, $p < .001$) engage[d] more career planning than other students. Those students who had done career planning also tended to have more general interaction with other students (SSGNRL; $F(1,101) = 9.022$, $p < .01$), to have worked during their senior year (CURWKHRS; $F(1,100) = 6.819$, $p < .01$), and to have lived on-campus during college (RESHSG; $F(1,99) = 9.317$, $p < .01$).

Participation in Career Oriented Organizations (PGCASSOC). No significant relationships were found between this outcome and any of the relevant input variables. However, two intervening variables were positively related to this outcome. Both participation in academic clubs (PRXCUR3; $F(1,101) = 15.886$, $p < .001$) and discussing personal problems with faculty members (FSPSNL; $F(1,100) = 7.784$, $p < .01$) tended to increase student participation in career oriented organizations.

Confidence about Future Career Opportunities (PGCACONF). One input variable was found to be significantly related to this outcome. Participation in athletics during high school (HSXCATH; $t(158) = 2.603$, $p < .01$) tended to increase student confidence about future career opportunities. One intervening variable was also found to be related to this outcome. Student interaction with faculty within their major (FSNMAJ; $F(1,103) = 10.423$, $p < .01$) also served to increase student confidence in this area.

Knowledge about Marriage, Children, and Personal Goals (PGPSNL). Regression of this outcome on the relevant input variables yielded two significant relationships. Those students who participated in academic groups or worked part-time during high school (HSXCORG; $t(136) = 3.112$, $p < .01$) and those who had high grade point averages during high school (HSGPA; $t(136) = 2.581$, $p < .05$) were more knowledgeable in this area than other students. No significant relationships were detected between this outcome and any of the intervening variables.

Knowledge about Career Opportunities (PGCAKNOW). Although no significant relationships were found between this outcome and any of the relevant input variables, one significant relationship with an intervening variable was found. The more general interaction a student had with other students (SSGNRL; ($F(1,101) = 12.157$, $p < .001$), the more knowledgeable he or she tended to be regarding career opportunities.

Educational Satisfaction

Global Satisfaction (SRSAT). Two input variables were found to be significantly related to this outcome. A student's expected level of satisfaction (EXPSAT; $t(168) = 2.525$, $p < .05$) was found to be positively related to her or his reported level of satisfaction. However, those students who participated in athletics during high school (HSXCATH; $t(168) = -2.136$, $p < .05$) tended to report a lower level of satisfaction than other students. In addition to these relationships, one intervening variable was found to be related to global satisfaction. As a student's interactions with faculty within his or her major increased (FSNMAJ; $F(1,100) = 21.809$, $p < .001$), her or his satisfaction also increased.

Aggregate Satisfaction (SRACT). When this outcome was regressed on the relevant input variables, two significant relationships were found. The more activities in which one expected to participate during college (XACT; $t(138) = 3.657$, $p < .001$), the higher one's level of aggregate satisfaction. In addition, the higher one's score on the Defendence scale of PRF as an entering freshman (FRPRFDE; $t(138) = -2.287$, $p < .05$), the lower one's level of aggregate satisfaction. Two significant relationships were also found between this outcome and the intervening variables. Those students who more frequently interacted with faculty within their major (FSNMAJ; $F(183) = 9.233$, $p < .01$) tended to report a higher level of satisfaction than other students, while those students who had participated in choir and career service programs during their senior year (SRXCUR5; $F(1,82) = 9.679$, $p < .01$) tended to report a lower level of satisfaction than other students.

Satisfaction with Faculty Contact (SRFACSAT). Two input variables were found to be significantly related to this outcome. A student's expected level of satisfaction (EXPSAT; $t(149) = 2.823$, $p < .01$) was found to be positively related to his or her perceived level of satisfaction, and participation in athletics during high school (HSXCATH; $t(149) = -2.249$, $p < .05$) was found to be negatively related to this outcome. Two intervening variables were also found to have significant relationships with satisfaction with faculty contact. The more general interaction a student had with faculty members (FSGNRL; $F(1,100) = 32.737$, $p < .001$), the higher the student's satisfaction with the faculty tended to be. However, participation as an officer in extracurricular activities (XACTOFF; $F(1,99) = 7.212$, $p < .01$) tended to reduce a student's reported level of satisfaction with faculty members.

Satisfaction with Recreation and Family Contact (SRRECSAT). The regression of this outcome on the relevant input variables yielded two significant relationships. Both the number of activities in which one expected to participate during college (XACT; $t(146) = 3.396$, $p < .001$) and participation in athletics during high school (HSXACT; $t(146) = 2.684$) were positively related to recreational satisfaction. When this outcome was regressed on the intervening variables, one additional relationship was found. Those students who had participated in choir or career service programs during their senior year (SRXCUR5; $F(1,96) = 7.477$, $p < .01$) tended to be less satisfied than other students.

Satisfaction with Social Life (SRSOCSAT). Three significant relationships were found when this outcome was regressed on the relevant input variables. Those students who expected higher satisfaction with leisure and family contacts (XRECSAT; $t(131) = 3.983$, $p < .001$) reported higher levels of satisfaction with their social lives. Students who scored high on the Desirability scale of the

PRF as entering freshman (FRPRFDY; $t(131) = -2.500$, $p < .05$) tended to report lower levels of satisfaction in this area as seniors. In addition, students who had higher high school grade point averages (HSGPA; $t(131) = 2.247$, $p < .05$) also tended to be more satisfied with their social lives. Only one intervening variable was found to be significantly related to this outcome. Those students who worked part-time off campus as seniors (CWKEXP3; $F(1,85) = 7.342$, $p < .01$) tended to report a more satisfying social life than other students.

In summary, we found that, after accounting for the relevant differences among incoming students, many intervening variables were unrelated to most or all of the student outcomes measured in this study. Some intervening variables (i.e. student-student interaction, participation in various extracurricular activities, and living in on-campus housing) were occasionally related to a limited number of outcomes. However, a strong and repeated positive relationship was found among the various faculty-student interaction variables and at least two-thirds of the outcomes. We conclude that amount and quality of faculty-student interaction plays a key role in determining the levels of the outcomes addressed in this study. In terms of the goals and objectives of this College it appears that faculty-student interaction is the dominant factor with which administration can address program development and evaluation issues.

DISCUSSION AND CONCLUSIONS

We believe the research program and the results reported in this paper have implications for the College and for institutional research. The input/output analysis used by Astin (1977) and adapted by Elfner (1977) appears to be a useful tool for the study of institutional impact on student characteristics. We realize the analysis is correlational in nature; the cause and effect inferences made from the data should be interpreted with caution. However, the use of

multivariate techniques which statistically control for the impact of student characteristics decreases the likelihood that such inferences are contaminated by noninstitutional variables.

It is probably not surprising that the amount and quality of student/faculty and student/student interaction are positively related to student satisfaction with the college experience. Previous research by Endo and Harpel (1982), Pascarella and Taronzini [1980], Feinberg [1972], Tarenzini, and Pascarella [1980], for example, arrived at similar conclusions. What is more interesting is that such interaction is positively related to the institution specific student outcomes such as clarification of personal goals and the perception that the institution made a greater contribution to intellectual development.

We are uncertain that the specific relationships found in this study will also be found at other institutions, especially those that may differ in size or educational orientation. Although it is possible that the results may be limited in generalizability, it is likely that the methodology can be usefully applied at any college or university. We believe we have shown that even institutions with modest research budgets and limited staff time can conduct useful research relevant to the demands of accountability and helpful in institutional planning.

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